Paradigm Breaking and Huetragogy: An RMIT Training and Education Solution

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The Applied Technology Framework (ATF) is a pragmatic research project aimed at meeting the needs of enterprises (particularly small to medium firms) working in areas of rapid technological change and/or emerging industries. It has been designed as a flexible framework for the recognition and support of work-based learning. This paper is a reflection on the expanding application of the ATF and a strong condemnation of the trenchant pedagogically based status quo. The paper then discusses the successful trial of the Framework at a Victorian-based tooling company, Plastool. Parallel national and international training experiences of 'break out' training models are also discussed. RMIT is now piloting the Framework within the plumbing, building services, tool design and automotive and aerospace component manufacturing industries and further papers will be written at a later date.

The paper calls for the overthrow of a deep-seated philosophical bias in the Australian Vocational training system which gives primacy towards pedagogy (the art and science of teaching children) against andragogy (the art and science of teaching adults) and impedes the evolution to huetragogy (the art and science of developing and supporting self-directed learners).

This bias tilts the power balance in favour of rigid organisational structures inherent in international and national corporations, mega-unions, large training bureaucracies, and publicly funded training providers, against small-to-medium enterprises (SMEs). The latter need help to upskill staff in order to survive, let alone thrive, in a rapidly globalised, deregulated and competitive business environment.

The pedagogy versus andragogy debate is more than an academic exercise. We have found that rigid adherence to the pedagogy orthodoxy has ossified the Australian training system in to a state where it cannot go forward and it cannot go back. The bias manifests itself in the following forms:

- learners *must* be taught
- teachers *must* teach and they *must* teach a pre-set curriculum
- learning takes place in a classroom with a teacher who hands out notes that *must* be learnt by rote
- The curriculum *must* be set by an antiquated industrial relations process that settles for compromises between ambit, and largely irrelevant, claims from big business on one hand, and mega-unions on the other hand.

This system has failed with regard to the competencies, let alone capabilities, needed at any time, and the methods by which the content is delivered. In this system, nominal hours (student contact hours) means mandatory hours sitting in a classroom being 'bored to death', by someone, who in many cases, has not worked in industry for many years.

In this system, individual experience accounts for nothing. It is the notion that

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'we have to get through this material' regardless of the pre-existing competences of individuals within the class that currently dominates classrooms for young and old alike.

The time has come for this ossification of pedagogy to be overthrown. Profound changes in the social, economic and demographic landscape have changed the needs of today's learners. Recent breakthroughs in cognitive science have revealed the importance of deep-seated implicit knowledge below the level of conscious thought. We bring to tasks far more than classroom-learnt knowledge but also deep problem-solving knowledge that we have learnt through the life cycle.

The traditional classroom instructional method for post-trades education and training still relies on a competency-based system that assesses rote learning and not the ability to solve problems or anticipate the contradictions and paradoxes which new technology may introduce. Learners are 'disempowered' because they are told they must jump over numerous assessment hurdles each with a range of competencies before they have reached a certifiable standard. We are teaching them how to hurdle. Not to form teams and problem-solve.

Paradigms at War

As long as the Australian training system stays fixed to the functionalist–positivist–quantitative paradigm, as represented by the outmoded pedagogical methodology, then training must necessarily be inefficient and ad hoc. The paradox is that this paradigm has traditionally been wedded to capitalism, yet it is intransigence to any other forms of thinking and doing, exposes it to large scale productivity inefficiencies, to productivity gaps and worker alienation, at a time when Australia needs to boost its industrial output and compete with low wage paying Asian nations.

In short, adherents of this paradigm 'feed' workers training *en bloc*. Training is just one cog of an organisational 'machine' (Morgan,1997, p. 11). It is seen as an isolated phenomena, where workers consume information and then try to apply it in their workplace. Is it any wonder that there are massive inefficiencies in the Australian manufacturing sector? Is it any wonder that industry leaders complain about people turning to the professions rather than seeking post-trade up-skilling?

Andragogy has a learner-directed focus. It informs learners about why something is important to learn; it shows them how to direct themselves through information; it relates the topic to the learners' experiences; it recognises that people will not learn until they are ready and motivated to learn and that this requires helping them overcome inhibitions, behaviours and beliefs about learning (Conner, 2004, p. 1)

Andragogy recognises experience. This paradigm is not found in any of the traditional analysis of teaching and learning as it is still evolving. Adherents of the Mixed Methods Pragmatic Paradigm deal with the practical problems that confront themselves as educators and trainers. They view modes of enquiry as tools to understand and solve problems. They recognise that training and education is only meaningful within the context in which it is to be used. It takes into account the notion of 'complexity' where as the functionalist–positivist–quantitative paradigm wants to 'smash square blocks in to round holes'.

> It is becoming increasingly clear that the comfort of a good fit between man and machine is largely absent from the technology of the information age (Sedgwick, 1993 p. 96).

As Stewart Hase and Lester Davis state in *The River of Learning in the Workplace*,

> ... there is a pragmatic reason, particularly for the vocational education and training sector, that has to do with the world in which we live. It is a world in which information is readily and easily accessible; change is so rapid that traditional methods of training and education are totally inadequate; disciplined-based

> knowledge is inappropriate to prepare for living in modern communities and workplaces; learning is increasingly aligned with what we do; modern organisational structures require flexible learning practices; and there is a need for immediacy of learning (Hase & Davis, 2002, p. 2).

Both andragogy and heutagogy recognise complexity. Pedagogy does not.

Who and What Are the Change Blockers?

The tooling industry in Australia runs the risk of terminal decline within 5 years, as training and education has failed to give them adequate service. The tooling industry make the die tools used to manufacture pressed metal, plastic, and more recently, new composite material components for the automotive and aerospace industries as well as homeware consumer goods.

The industry largely consists of small to medium sized enterprises (SMEs). It is 'covered' by the Metal Trades Industry Training Package. The training package has been dominated by the needs of mega-unions and corporations and the needs of SMEs have been largely ignored.

Professional Development for Teachers

Nowhere in the VET funding model is there systematic provision for professional development for teachers. This means that they cannot possibly keep abreast of current technical, programmatic or sociocultural developments in industry as they are effectively 'sheltered' by the walls of their institutions. Professional development funding is axiomatic if progressive workplace reform is to emerge.

New and young talent needs to work in both industry and teaching. Strategies are required so that they 'action learn' and reflect upon their time in business. We need to ensure that existing knowledge of near retirement experts in precision engineering (and other industries) is passed on to the new generation. The demographic imperative makes this a pressing issue. Senior baby boomers have a wealth of expertise. They need to be made a valuable educational resource. This is an especially pressing issue in the Queensland power grid, where the original constructors of the grid are reaching retirement age and there is a critical shortage of skilled technicians who can take their place.

It Is More Than Technical

The technological age requires a broad range of workers beyond the basic delivery of competencies. They also need to show capability, which includes research skills, communication skills, problem-solving abilities and an understanding of the dynamics of team building and their function in the modern workplace. Depending on the industry, both teachers and learners will need clear and concise contemporary understandings of new factors such as environmental sustainability and systems design.

Enterprise Culture/Organisations Need to Recognise Workers Existing Knowledge and 'Life Skills'

One of the recent models to challenge traditional concepts of learning looks at the process of capability. Capable people know how to learn; they are creative and possess a high degree of self-efficacy. They can apply competencies in novel as well as familiar situations. When compared with competence, relating to knowledge and skills, capability describes a more holistic attribute. The process is a key concept of andragogy as it focuses on the need to learn how to learn, rather than teacher-centred learning (Coughlan, 2004, p. 3).

Research Centres Need to Find New Ways of Working with Industry

There needs to be linkages between VET teachers and researchers, higher education lecturers and researchers and members of cooperative research centres. It is patently

ridiculous that three educational entities should, in some cases, compete for grants when each may have unique vectors of analysis and research they could bring to the table.

CRC grants, so often the prime money generator for many higher education schools (especially the sciences) should show a pragmatic connection with VET.

There needs to be more research to solve the paradoxical or 'wicked' problems facing business through the introduction of new technologies, complex HR issues, fiscal deregulation, and so on. Yet educational institutes need to be made aware by industry of these issues.

Internal Bureaucrats

The RMIT program accreditation system is 96 pages of instructions and templates on 'how' to get a VET program accredited. There is no induction or training in the education of instructional design or in the use of the accreditation system. Staff simply 'jump hurdles'. It can take up to 3 months to accredit a 10-week short course. No staff would hazard a guess at a commencement date for that industry client. They have embraced the model the pedagogy and refuse to give it up.

Industry

One of the most consistent themes that we, as researchers encountered in industry was the agreed view that the current system did not deliver what was needed. Yet at the same time, the alternative, which was a targeted productivity program based on a flexible credential framework, delivered in the workplace was countered in the terms and language of the old system; for example, 'how many hours?', 'What technical training?' Or, 'It's a terrific program, I'd like to do it myself but it's not what we expected of a training program'.

Australia languishes at the bottom of the OECD table in terms of industry investment in research and industry investment in training, measured as a percentage of GDP. One reason is that the mixed economy model has developed a dependency by industry on Government handouts or as tax breaks for any investment in R&D. A corollary to analysis is the recognition that such investments are not understood as intrinsically contributing anything to productivity or profitability, or survival in a competitive business environment.

The Applied Technology Framework (ATF)

This is a nest of credentials, which as a pilot has been especially tailored for the Australian manufacturing sector. It allows learning related to the resolution of workplace problems associated with the introduction and use of new technologies to be supported and recognised in terms of industry competence standards. It is not a departure from competencies. The ATF has been designed around fully articulated qualifications ranging from a Certificate 4 in Applied Technology through to a Diploma, an Advanced Diploma, a Batchelor degree and a Graduate Certificate in Applied Technology.

A key purpose in developing the Applied Technology Framework is that while it is based on a different model of the development of competence from that used within mainstream vocational education and training, it still uses the same building blocks (i.e., units of competency from endorsed training packages) and is consistent with the aims of the National Training Framework.

> Finding solutions to workplace problems involves a process of learning. This learning is generally unstructured and involves the construction of new knowledge about the workplace, its processes and practices. The ATF project seeks to establish a framework, which allows learning, related to the resolution of workplace problems related to the introduction of new technologies ... The design and conduct of all learning activity [is] based on a recognition that the learners are adults and bring to their learning unique sets of skills, knowledge, experience, attitudes,

beliefs, values and cognitive development (Down, 2003b, p. 1).

However, the Framework is more than a set of fully articulated qualifications. It represents a distinct, yet flexible, approach to the enhancement and recognition of workplace learning through problem-solving and/or investigative projects. It uses structured reflection, as per Rogerian tenets within andragogy, to ensure that the tacit understandings which enhance work performance are explored and made explicit.

The ATF provides the flexibility to:

- rapidly develop and implement the training component of the solution
- deliver the solution on the job
- incorporate competencies as required, including generic skills
- enable training tailored to individual needs within an enterprise or cluster of enterprises
- provide trainees with a statement of competencies achieved, or recognised, and where appropriate, a higher award
- identify where new competencies are required. Develop them and put them in to the system for accreditation, thereby completing the cycle.

At present, it is assumed that those who will come under the Framework's cover will be those in employment, who have initial trade qualifications or work experience and are in situations where technological development has had a significant impact on their work.

The RMIT Productivity Solutions Approach

The rapid emergence of knowledge economies around the world is changing the nature and level of demand for education and research. RMIT's challenge was to adopt a far more innovative and flexible approach which was found in the teaching and learning philosophies of andragogy and heutagogy.

The Productivity Solutions Approach (PSA) places the industry client at the centre of the business relationship. It applies theoretical and practical work-based training, which not only satisfies the needs of the employer but necessarily uses cross-disciplinary research, consultancy and training within RMIT. The PSA reinforces the notion of a seamlessness between education, training and the broader business community (Martin, 2003)

Productivity solutions is an integrated approach to providing research, consultancy and training to fix industry productivity gaps. Government and private research shows that the current system needs to change to meet and suit new and emerging industry needs. The PSA is a systematic response to this issue.

The focus can no longer be on developing and maintaining narrow relationships between a discipline, subject or course. The focus now needs to be on developing and maintaining industry relationships which harnesses the entire range of resources across the nation or internationally (using the Internet).

RMIT already has many areas of specialisation, especially in advanced manufacturing, which can, and have been brought together, in the case of the Victorian plastics injection company, Plastool, to produce significant value adding possibilities using existing disciplines within and external to RMIT.

How Does the RMIT Productivity Solutions Approach Work?

The PSA concentrates on client service rather than selling 'offerings'. Within RMIT a lead consultant manages these partnerships. The role of the consultant has shifted from selling a product to developing a business relationship with an industry partner to help them identify performance gaps and to broker solutions.

The lead consultant works with the client to identify the underlying performance problems or assists in the identification of

potential new market opportunities driven by new technology.

The consultant calls in experts from across RMIT and beyond and then develops cost effective solutions with the client. A fee for this service is then negotiated.

RMIT staff using the PSA first identify the productivity problem(s), then clarify, in collaboration with industry what strategies will be employed and how training, consultancy and/or research will improve productivity. It is important to note that training is delivered as part of a team activity which has as its core concern, customer satisfaction by improving productivity and educating their workforce so they can educate themselves.

It is also important to note that RMIT may be just one agent in forming a team to provide a solutions approach. The PSA and the methodology of the ATF rejects notions of competition in favour of inclusion of educational training partners, no matter where they are in Australia.

The driving concepts are raising productivity by teaching learners how to learn.

The Plastool Project

Plastool Pty Ltd is a Victorian company which makes tools for the manufacturing sector. They machine the metal moulds that are used to shape numerous objects which we take for granted in life such as car components, interior fittings, surgical instruments, chairs, and so on. The precision engineering and tooling industry, to which Plastool belongs, underpins the capability within the advanced manufacturing sector of our economy.

In discussions with RMIT staff, Plastool identified a number of skill gaps due to the introduction of new technology. The driving economic problem was Plastool needed to increase their productivity by 30% to remain competitive with their Asian competition. This provided RMIT with an opportunity to test the PSA within the methodology of the ATF.

The goal of the training was to contribute to the building of an effective work team with a specific skill base in machine dynamics, controller technology and cutter technology. The team also required better understanding of systems design. Yet as we found out, it became clear that the implementation of new technology also introduced new ways of working and new communication dynamics. The interwoven nature of business skills, communication skills, psychology, and technical skills in workplace learning, was highlighted by Plastool's recognition that the problem-solving approach of the ATF developed underpinning structures, method and culture for their other planned initiatives.

Plastool Operations Executive and consultant, Michael Burdette operates on the basis 'that the only effective way to measure productivity is to identify the three dimensional factors of the real time shop floor activity, that the three dimensions of productivity are labour, process efficiency and machine utilisation' (as illustrated in Figure 1, and detailed below; personal communication, 2004).

- *Labour efficiency* is defined, in part, as the ratio between value adding hours versus non-value adding hours. It is also, in part, measured in terms of time benchmarks set for individual tasks and/or processes.
- *Process efficiency* is the pre-planning and scheduling of equipment, resources, materials and labour coupled with the design of the production system which includes the layout of machinery and labour on the shop floor.
- *Optimum machine utilisation* is dependent upon shop floor layout, availability of machine tools, jigs and fixtures, hardware technology and software. It is measured, in part, as the ratio between attended machine labour versus unattended machine labour. It is also measured, in part, as the ratio between total machine hours versus total direct labour hours.

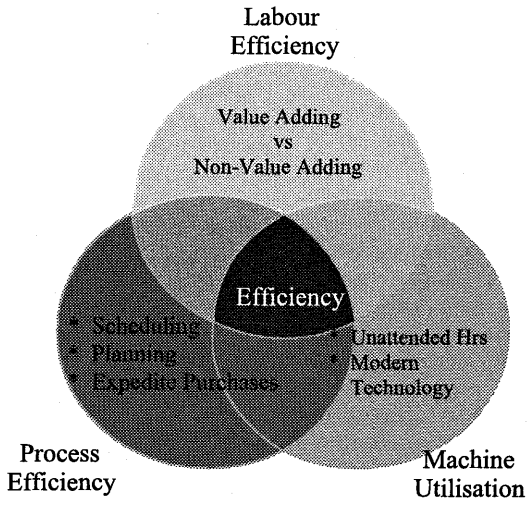

Figure 1
The three dimensions of productivity.

It is essential that training be introduced and developed, because all aspects of productivity are dependant upon the 'complete skills package' of the entire enterprise workforce being developed to meet the unique needs of an enterprise' (M. Burdett, personal communication, 2004).

After 12 weeks of working with Plastool, the company reported significant efficiency improvements and 12 months later, despite continuing strong competition from Asian economies has been able to maintain and improve on efficiencies gained as a result of the program.

This analysis emphasises the fact that SMEs have not been able to contribute to the development of training which is relevant to them. Even large industries are often not well served by the national training system.

That is certainly what we found at Plastool Pty Ltd. Little of the learning that took place, came from the Metals Training Package. The technical training in high speed Computer Numerically Controlled (CNC) machining went way beyond anything existing in the Training Package. Importantly, however, most of the learning that went on at Plastool was in competencies that either did not exist at all in the system, or came from many other packages at many different levels.

Plastool is not an isolated instance of new thinking emerging in training.

Comparison with Thiess Pty Ltd and the Junee Prison Project

The flexibility, upskilling and an emphasis on inclusion which arose from the Plastool Project has much in common with Dr Stewart Hase and Lester Davis's paper on a Theiss Pty Ltd training project. Their heutagogical approach with its emphasis on self-directed learning and creativity (learning to learn) is based in humanism, systems thinking, phenomenology, organisational

learning, andragogy and more (Hase & Davis, 2002, p. 1).

Theiss was commissioned to build a prison in Junee in the early 1990s. The project sought to employ as many local residents as possible and involve the workers in 'workplace teams'. The teams were given the task of scheduling work, programming and ensuring the skill development of the workers as well as accounting for the activities assigned to them. All teams on the Junee Prison project were given work activity briefings. But these were not top-down directives. This is the same method used in the Plastool Project.

At these meetings, called work activity briefings, information such as activity details, engineering details, risk analysis, skill development needs and an action plan became points for discussion.

> The outcome of the dialogue represented a *harvesting* [author's italics] of the available knowledge, skills and experiences that were requisite in the participants of the activity ... In sociotechnical systems, the parlance of self-governing teams provide a mechanism by which the technical needs of the work and the social needs of the individual and group can be drawn together to improve the quality of the working life. The work activity briefing process employed with this organisation brings together all parties involved in the activity (Hase & Davis, 2002, p. 3).

The move away from functionalist training is international.

Comparisons with the Irish Training Experience

Ray Coughlan, the Head of the Department of Education Development, Cork Institute of Technology, cites a number of training and education projects where a critical role of the provider is the 'establishment and maintenance of the communication and support links between learner in the workplace and the learning resources — both human and material — which may reside in the educational institution, in the workplace or even elsewhere' (Coughlan, 2004, p. 4).

Coughlan states that

> While some advances are taking place, there is still, however, a persisting model of the education process, which is essentially teacher and program centred.
>
> The result was an education system promoting a form of pedagogic relationship between the teacher and learner in which the teacher largely determined both the process and the outcome. The teacher determined both what was to be learnt and how this was to be taught (Coughlan, 2004, p. 3).

Coughlan states that the Irish training system published a White Paper on Adult Education, established a National Qualifications Authority and defined a national policy of developing a knowledge-based society. Yet of major interest, in line with the Plastool Project and the unique, holistic training experience undertaken by Theiss Pty Ltd, Coughlan cites a number of successful projects which break the functionalist paradigm.

These include three partnership programs for first-line managers in the chemical/pharmaceutical industry, the Irish Institute of Herbal Medicine and lastly with a Clean Technology Centre.

The crucial point is that the staff were not made to sit in out-moded 'chalk and talk' sessions. Maximum recognition was made of life knowledge they already possessed and had gained from a variety of ineffable sources.

The Irish recognise that education and training are fundamental to an innovation economy. They are promoting a culture of lifelong education and skills formation and raising educational attainment across the Republic. They are creating an educational and training framework that meets the current and future needs of the economy.

Conclusion

Building and fostering linkages domestically between firms, and between firms and

institutions, is fundamental to competitiveness and new ways of carrying out business. Clearly we have to develop and share new knowledge by linking those with specialist expertise to those who need it most in industry, especially those dealing with new technologies. We have to translate VET and higher educational research and other capabilities in educational institutions into commercial outcomes. We will do this by adopting a new training and educational paradigm that puts the learner 'in the drivers seat' in partnership with teachers, mentors, instructional designers, consultants and industry specialists. That is the way to promote critical thinking and productivity gains.

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